SECTION 206

EXCAVATION FOR STRUCTURES

206.1 Description.

206.1.1 This work shall consist of the necessary excavating for the foundations of all structures, the removing and disposing of all excavated material, the backfilling around the completed structures and all related work.

206.1.2 No direct payment will be made for removing existing structures within the limits of excavation for structures. However, existing headwalls or culvert concrete to be removed will be paid for as removal of improvements for roadway culverts or partial removal of culvert concrete for bridge culverts. All removal work which might endanger the new structure shall be completed before any work on the new structure is started. Partial removals of any structure or adjustments of any utility shall be made with care to preserve the value of the retained portions. Work around any live utility shall be done in such manner that uninterrupted service is maintained.

206.1.3 Excavated material which is unsuitable for backfill and embankments, and excess material not required for either, shal be disposed of. It shall not be dumped into the channel of a stream without the written authorization of the engineer.

206.2 Depth of Excavation. The elevation of the bottoms of footings as shown on the plans shall be considered an approximate elevation, and the engineer by written order may make such changes in plan elevations and dimensions of footings as may be necessary to secure a satisfactory foundation.

206.3 Foundation Stabilization and Tests. The contractor shall furnish and place sand, rock, gravel or other suitable backfill material to replace unsuitable material encountered below the foundation elevation of the structures. The contractor shall stabilize suitable foundation material or form the bottom of pile footings if necessary to obtain a stable foundation. The contractor shall furnish assistance in driving sounding rods or drilling test holes to permit an adequate inspection of the foundation. The depth of the excavation, the character of the material and the condition of the foundation shall be approved by the engineer before any concrete is placed in the footing.

206.4 Construction Requirements.

206.4.1 Methods shall be used in excavating for foundations of structures that will ensure maintaining the stability of the material adjacent to the excavation. Sheeting, cribbing, timbering or bracing shall be placed by the contractor where indicated on the plans and wherever considered necessary. The contractor will be held responsible for the adequacy of all sheeting, cribbing, timbering or bracing used.

206.4.2 Foundations for structures and retaining walls shall be free of loose, shelly or disintegrated rock, and the footing shall be placed on undisturbed material. Footings shall be keyed not less than 6 inches (150 mm) into hard, solid rock and not less than 18 inches (450 mm) into soft rock or shale or other suitable material specified for spread footings.

Excavation in rock or shale for the key shall be made as near as practicable to the size of the footing, or of the key as shown on the plans. When placing the footing, the key portion shall be cast against the vertical, undisturbed face of the rock or shale. If side forms are necessary for footings, they shall be removed approximately 24 hours after placing the concrete, and the excavation immediately backfilled to the top of the footing. All cavities or crevices shall be cleaned out and filled with concrete in accordance with Sec 703.3.12.8, or spanned with a reinforced concrete beam, as directed by the engineer.

206.4.3 Care shall be taken to avoid disturbing the material below the bottom of the footings where the structure is founded on material other than rock, and final removal to grade shall not be made until just prior to placing concrete. Where foundation piles are required, the excavation of each pit shall be completed before the piles are driven, and after the driving is completed all loose and displaced material shall be removed.

206.4.4 If rock is encountered under a portion of the bottom slab of a concrete box-type structure, the rock shall be removed to at least 6 inches (150 mm) below the bottom of the slab and curtain walls, and backfilled with material similar to that under the remainder of the structure.

206.4.5 Concrete footings for structures shall be placed on reasonably dry foundation material. The contractor shall perform all draining, bailing or pumping operations, drive any sheeting, and construct any cofferdams or cribs necessary to obtain this condition. Pumping from the interior of any foundation enclosure shall be done in a manner to preclude the possibility of the movement of water, or other fluids or semi-fluids, through any fresh concrete. If necessary, the footing form shall be made watertight and shall be sealed around the bottom, and all pumping done between the footing form and the wall of the enclosure.

206.4.6 All holes, pits or sumps resulting from excavating operations shall be kept drained or pumped out until the completion of the work. No ponding of water around footings on other than rock will be permitted.

206.4.7 Cofferdams. Cofferdams shall, in general, be carried well below the bottom of the footings, and shall be well braced and as watertight as practicable. The interior dimensions of cofferdams shall provide sufficient clearance for the construction of forms and ample room for a sump and for pumping outside the footing forms. Cofferdams which have been tilted or moved laterally during the process of sinking shall be corrected to provide the necessary clearance. They shall be constructed to protect the work against damage from sudden rising of the stream and to prevent damage to the foundation by erosion. Cofferdams, with all sheeting and bracing, shall be removed after the completion of the substructure unit, unless specific authority is given for them to be left in place. The contractor, upon request, shall submit drawings showing the contractor's proposed method of cofferdam construction and other details open to the contractor's choice or not fully shown on the plans.

206.4.8 Seal Courses. Seal courses will be required if indicated on the plans or if conditions are encountered which, in the judgment of the engineer, render it impracticable to dewater the foundation area. The dimensions of the seal course shall be adequate to seal the foundation area. Pumping will not be permitted while excavating, driving piling or placing the seal course, and not until, by determination of the engineer, the seal course has attained sufficient strength to withstand the hydrostatic pressure. If seal courses are shown on the plans, and it develops that the footings may be satisfactorily placed without sealing, the contractor will be required to dewater any completed excavation for investigation purposes. Seal courses, other than those on the plans, will not be authorized or permitted except for extreme cases where it is impracticable to dewater the footing area by other means, and then only with the written permission of the engineer.

206.4.9 Backfill. Backfill material shall be of an acceptable quality and shall be free from large or frozen lumps, wood or other extraneous material. All spaces excavated and not occupied by the new structure or by porous backfill shall be refilled with earth to the original ground surface or to the finished ground lines shown on the plans. All backfill shall be thoroughly compacted and its top surface neatly graded. The backfill at end bents, walls or other units which fall within the limits of the roadbed shall be placed in successive 6-inch (150 mm) layers and compacted to the same density required for the adjacent roadbed. Special precaution shall be taken to prevent any wedging action against the masonry. The slope bounding the excavation, if steeper than six horizontal to one vertical (one vertical to six horizontal), shall be stepped or serrated. Backfill placed around culverts and piers shall be kept at approximately the same elevation on opposing sides. Drains consisting of 5 cubic feet (0.15 m^3) of coarse aggregate shall be placed at weep holes except where porous backfill is required. Backfill material shall not be placed against end bents of bridges, sides of box culverts or back of retaining walls until the concrete has attained the strength specified in Sec 703.3.10. Backfill material shall not be placed higher behind than in front of end bents until the superstructure is in place. Until the grade is in place, drainage shall be maintained away from the end bent backwall by constructing a six horizontal to one vertical (one vertical to six horizontal) or steeper slope away from the backwall for a minimum distance of 3 feet (1 m) and providing a lateral path for all water to flow off the roadbed section.

206.4.10 Porous Backfill. Porous backfill meeting the requirements of Sec 1009 shall be placed in back of abutments, wings and retaining walls where specified and shown on the plans. It shall be 18 inches (450 mm) thick and shall extend from the bottom of weep holes or other drainage devices to within 2 feet (600 mm) of the finished ground line. The remaining 2 feet (600 mm) shall be backfilled with earth. Porous backfill shall be so placed and consolidated in successive 12-inch (300 mm) layers that it will not become mixed with other backfill material.

206.4.11 Flowable Backfill. Flowable backfill will be required when indicated on the plans. The contractor may, with the approval of the engineer, use flowable backfill as an alternate to compacted backfill for structures, pipes or utility cuts. Flowable backfill intended for any other use by the contractor shall also be approved by the engineer. Flowable backfill shall not be used to surround drainage systems such as vertical drains or edge drains. Flowable backfill shall meet the requirements of Sec 621.

206.4.12 Excavation Classification. Unless otherwise shown on the plans, excavation for structures will be classified as Class 1 Excavation, Class 1 Excavation in Rock, Class 2 Excavation, Class 2 Excavation in Rock, Class 3 Excavation or Class 3 Excavation in Rock. In general, Class 1 Excavation and Class 2 Excavation will apply to excavation for bridges and large retaining walls. Class 3 Excavation will apply to excavation for culverts, concrete box-type structures classed as bridges, sewers, small retaining walls and other miscellaneous structures. Class 1 Excavation will include all excavation above a specified elevation indicated on the plans while Class 2 Excavation will include all excavation below this specified elevation. The classification of excavation for all structures will be shown on the plans. Any material excavated in cleaning out culverts which are used in place will be paid for at the contract price per each structure. However, only the initial excavation will be paid for, and any subsequent cleaning required prior to final acceptance shall be done at the contractor's expense.

206.5 Method of Measurement.

206.5.1 Measurement of Class 1 and Class 2 Excavation will be made to the nearest 1/2 cubic yard (0.5 m^3) for each structure of that volume of material actually removed from within the limits herein established. The volume measured will be limited by vertical planes 18 inches (450 mm) outside of and parallel with the neat lines of footings, tie beams or overhangs of

structures classed as bridges or retaining walls. The upper limits of the volume measured will be the existing ground line or the lower limits of the roadway, drainage or channel excavation, including any allowable overbreak, whichever is lower. Where roadway spill fills are required to be placed and compacted before driving piles or before constructing bridge substructure units, any required additional excavation for the substructure units will be measured from the spill slope. For stream crossings, the measured volume will not include water, but will include mud, muck and other semi-solids. The lower limits of the volume measured will be the bottom of the footings, bottom of seal courses, or 18 inches (450 mm) below the bottom of tie beams and overhangs. For timber bents, the excavation will be measured within the horizontal limits shown on the plans to the bottom of the backing supports for end bents, and to the bottom of the sway bracing for intermediate bents.

206.5.1.1 Excavation for columns above pedestal piles will be Class 1 Excavation with measurement being made of the volume of material actually removed above top of pedestal. The volume measured will not exceed that of a cylinder having a diameter 36 inches (900 mm) greater than that of the column above the pedestal. No measurement will be made of the material excavated for the pedestal below the bottom of the column.

206.5.2 Measurement of Class 3 Excavation will be made to the nearest cubic yard (cubic meter) for each structure of that volume of material actually removed from within the area bounded by vertical planes 18 inches (450 mm) outside of the outer walls of box culverts with bottom slabs or the sides of pipe culverts except as modified for vitrified clay pipe culverts in Sec 726.7.2 and except the volume of headwall and culvert concrete removals included in the contract for direct payment. The upper limits of the volume measured will be the existing ground line, or the lower limits of the roadway excavation, whichever is lower. Class 3 Excavation under embankments and in channel changes will be measured from the original ground surface unless otherwise designated on the plans. For box culverts without bottom slabs, measurement will be made as above except no material below plan flow line will be included which is outside of the area bounded by vertical planes 18 inches (450 mm) each side of and parallel with the neat lines of the walls or footings.

206.5.2.1 Final measurement of Class 3 Excavation for box culverts with a span of 6 feet (2 m) or less, pipe culverts, sewers and miscellaneous small structures will not be made unless there is an authorized change from plan location resulting in a different quantity or there is an authorized change averaging more than 6 inches (150 mm) in the foundation elevation. If a revision is made or an appreciable error is found in the contract quantity, the revision or correction will be computed and added to or deducted from the contract quantity. Measurement of Class 3 Excavation will be made for authorized excavation necessary to locate existing utilities requiring reconstruction work.

206.5.3 Where concrete in footings or walls is cast against the vertical faces of the excavation, the neat lines of the concrete footings will be considered the limits of excavation for that depth in which the concrete is in contact with the excavation, and no measurement will be made of any excavation or overbreak beyond the neat footing lines.

206.5.4 The volume of porous backfill will be computed to the nearest cubic yard (cubic meter) at each structure from dimensions on the plans. Any porous backfill material placed outside the neat lines shown on the plans shall be placed at the contractor's expense. Final measurement of the porous backfill will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity.

206.6 Basis of Payment.

206.6.1 Payment for additional Class 1 and Class 2 Excavation required to carry footings a maximum of 8 feet (2.5 m) below elevations shown on the plans will be made at 125 percent of the contract unit price for that additional excavation within the limits of Class 1, and at 150 percent of the contract unit price for that additional excavation within the limits of Class 2 Excavation. Additional excavation required to carry footings a depth of more than 8 feet (2.5 m) below plan elevations will be considered changes in the work, and will be paid for as provided in Sec 104.3.

206.6.2 Payment for drilling test holes for foundation tests will be made per foot (meter) of hole drilled at the fixed unit price specified in Sec 109.14.

206.6.3 Payment will not be made for removal or replacement of foundation material which became unsuitable because of improper methods of construction by the contractor. Payment for removal of inherently unsound material for foundation stabilization will be made at the contract unit price for excavation for structures. No payment will be made for any costs involved in replacing the volume below grade, except that the contractor will be reimbursed for the delivered material cost if a granular type material is specified by the engineer. Increased payment will be made only in cases where the presence of Class C Excavation material was not identified in information available under Sec 102.5 pertaining to soundings for spread footings.

206.6.3.1 If Class C Excavation material, as defined by Sec 203, is encountered in Class 1 Excavation, and no pay item for Class 1 Excavation in Rock is included in the contract, payment for that material will be made per cubic yard (cubic meter) at the fixed unit price specified in Sec 109.14.

206.6.3.2 If Class C Excavation material, as defined by Sec 203, is encountered in Class 2 Excavation and no pay item for Class 2 Excavation in Rock is included in the contract, payment for that material will be made per cubic yard (cubic meter) at the fixed unit price specified in Sec 109.14.

206.6.3.3 If Class C Excavation material, as defined by Sec 203, is encountered in Class 3 Excavation and no pay item for Class 3 Excavation in Rock is included in the contract, payment for that material will be made per cubic yard (cubic meter) at the fixed unit price specified in Sec 109.14.

206.6.4 No direct payment will be made for placing porous backfill at weepholes, as required by Sec 206.4.10, or for backfilling the structure.

206.6.5 The accepted quantities of excavation for structures and porous backfill will be paid for at the unit price for each of the pay items included in the contract.